

# Earth and Environmental Science, B.S.

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## Degree Offered

- Bachelor of Science

## Nature of the Program

The Bachelor of Science in Earth and Environmental Science exposes students to Earth systems, the processes that drive them, their impacts on human society, and how to apply the scientific method to investigate real-world problems. Graduates will be prepared for both specific and evolving career pathways including: environmental, hydrologic, geochemical, and geospatial consulting; the evolving energy industry (e.g., geothermal energy production, carbon extraction, and sequestration, and discovery and recovery of minerals critical to the battery/electronic production (e.g., rare earth elements)); regulatory agencies at state and federal levels; and entrepreneurial efforts to capitalize on the societal shifts that necessarily accompany our global shift towards a more sustainable future. They will also be well prepared for admission to graduate and professional schools.

Students in the Earth and Environmental Science BS will take courses that focus on geohazard assessment and mitigation, exploration and efficient use of land, water, energy and mineral resources, and developing adaptation and mitigation strategies to environmental and climate change.

## Minors

All students have the possibility of earning one or more minors; a list of all available minors and their requirements (<http://catalog.wvu.edu/undergraduate/minors/>) is available. Please note that students may not earn a minor in their major field.

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## FACULTY

### CHAIR

- Brent McCusker - Ph.D. (Michigan State University)

### ASSOCIATE CHAIR

- Joseph Lebold - Ph.D. (West Virginia University)

### PROFESSORS

- Kathleen Benison - Ph.D. (The University of Kansas)  
Regular Graduate Faculty, Sedimentary Geology - Planetary Geology
- Dengliang Gao - Ph.D. (Duke University)  
Regular Graduate Faculty, Exploration Geophysics, Petroleum and Structural Geology
- Amy Hessler - Ph.D. (University of Arizona)  
Regular Graduate Faculty, Biogeography, Forest Ecosystems, Climate Variability
- Brent McCusker - Ph.D. (Michigan State University)  
Regular Graduate Faculty, Livelihood Systems & Climate Change, Africa, Policy Making
- Brendan McNeil - Ph.D. (Syracuse University)  
Regular Graduate Faculty, GIS, Environmental modeling, Forest Ecosystem Services
- Shikha Sharma - Ph.D. (University of Lucknow)  
Regular Graduate Faculty, Isotope Geochemistry
- Jaime Toro - Ph.D. (Stanford University)  
Regular Graduate Faculty, Structure and Tectonics
- Dorothy Vesper - Ph.D. (Pennsylvania State University)  
Regular Graduate Faculty, Aqueous Geochemistry, Hydrogeology

### ASSOCIATE PROFESSORS

- Jamison Conley - Ph.D. (Pennsylvania State University)  
Regular Graduate Faculty, Spatial Analysis, Geocomputation, Health Geography
- Karen Culcasi - Ph.D. (Syracuse University)  
Regular Graduate Faculty, Geopolitics, Identity, Middle East
- Cynthia Gorman - Ph.D. (Rutgers University)  
Regular Graduate Faculty, Gender, Migration, Human Rights, Refugee Communities
- James Lamsdell - Ph.D. (The University of Kansas)  
Regular Graduate Faculty, Paleobiology, Arthropods, Macroevolution, Heterochrony, Paleoecology, Phylogenetics

## 2 Earth and Environmental Science, B.S.

- Rick Landenberger - Ph.D. (West Virginia University)  
Forest ecology, Land use Management and Restoration
- Joseph Lebold - Ph.D. (West Virginia University)  
Regular Graduate Faculty, Paleoecology, Paleontology, Regional Geology
- Maria Alejandra Perez - Ph.D. (University of Michigan)  
Regular Graduate Faculty, Cultural Geography, Science & Technology Studies, Speleology, Latin America and the Caribbean
- Amy Weislogel - Ph.D. (Stanford University)  
Regular Graduate Faculty, Sedimentology
- Bradley Wilson - Ph.D. (Rutgers University)  
Regular Graduate Faculty, Social Movements, Local/Global Food Systems, Food Justice

### ASSISTANT PROFESSORS

- Michael Harman - Ph.D. (West Virginia University)  
3D visualization, modeling complex landforms and processes, GIS
- Jacob Hileman - Ph.D. (University of California, Davis)  
Environmental Science, Sustainability
- Aaron Maxwell - Ph.D. (West Virginia University)  
Regular Graduate Faculty, Geospatial Instruction, Remote Sensing, Image Analysis, Spatial Modeling
- Holly Moulton - Ph.D. (University of Oregon)  
Feminist political ecology, Gender, Climate change adaptation, Indigenous studies, Critical development studies, ice loss, and Andean communities

### PROFESSOR EMERITI

- Robert Behling - Ph.D. (The Ohio State University)
- Timothy Carr - Ph.D. (University of Wisconsin - Madison)
- Joe Donovan - Ph.D. (Pennsylvania State University)
- Greg Elmes - Ph.D. (Pennsylvania State University)
- Trevor Harris - Ph.D. (University of Hill)
- Thomas Kammer - Ph.D. (Indiana University)
- Steven Kite - Ph.D. (University of Wisconsin)
- Kenneth C. Martis - Ph.D. (Michigan University)
- Henry Rauch - Ph.D. (Pennsylvania State University)
- Robert C. Shumaker - Ph.D. (Cornell University)
- Richard Smosna - Ph.D. (University of Illinois)
- Timothy Warner - Ph.D. (Purdue University)
- Thomas Wilson - Ph.D. (West Virginia University)

### Admissions for 2026-2027

- First Time Freshmen are admitted directly to the major.
- Students transferring from another WVU major or from another institution with fewer than 30 credits and 2.0 overall GPA are admitted directly to the major.
- Students transferring from another WVU major or from another institution with 30 hours or more must have at least a 2.0 overall GPA and meet the following requirement prior to being admitted to the major: completion of MATH 124 or MATH 126 with a C-.

Major Code: 14F6

### General Education Foundations

Please use this link to view a list of courses that meet each GEF requirement. (<http://registrar.wvu.edu/gef/>)

NOTE: Some major requirements will fulfill specific GEF requirements. Please see the curriculum requirements listed below for details on which GEFs you will need to select.

Code	Title	Hours
<b>General Education Foundations</b>		
F1 - Composition & Rhetoric		3-6
ENGL 101 & ENGL 102	Introduction to Composition and Rhetoric and Composition, Rhetoric, and Research	

or ENGL 103	Accelerated Academic Writing	
F2A/F2B - Science & Technology		4-6
F3 - Math & Quantitative Reasoning		3-4
F4 - Society & Connections		3
F5 - Human Inquiry & the Past		3
F6 - The Arts & Creativity		3
F7 - Global Studies & Diversity		3
F8 - Focus (may be satisfied by completion of a minor, double major, or dual degree)		9
Total Hours		31-37

Please note that not all of the GEF courses are offered at all campuses. Students should consult with their advisor or academic department regarding the GEF course offerings available at their campus.

## Degree Requirements

Students must complete WVU General Education Foundations requirements, Eberly Edge Program requirements, major requirements, and electives to total a minimum of 120 hours.

## Departmental Requirements for the B.S. in Earth and Environmental Science

- **Calculation of the GPA in the Major:** A minimum GPA of 2.0 is required in all courses applied to major requirements, with a minimum grade of C- in SUST 101/101L, SUST 102, SUST 201/201L, GEOL 286/286L, CHEM 115/115L, and CS 110/110L. If a course is repeated, all attempts will be included in the calculation of the GPA, unless the course is eligible for a D/F repeat.
- **Writing and Communication Requirement:** Earth and Environmental Science Bachelor of Science students fulfill the Writing and Communication Skills requirement by completing ENGL 101 and ENGL 102 (or ENGL 103), and two additional **SpeakWrite Certified Courses™**.
- **Areas of Emphasis:** Earth and Environmental Science majors will choose a curriculum from one of these Areas of Emphasis: Climate and Environmental Science; Geoscience and Sustainable Energy; GIS Methods.
- **Capstone Requirement:** The university requires the successful completion of a Capstone requirement. In Earth and Environmental Science, based on the Area of Emphasis (AoE): GEOL 403, GEOL 404, GEOG 452, or GEOL 496. The course selected for the capstone should not be already used to meet any other major requirement; students who complete GEOL 404 may apply the course to EDG 6.

## Curriculum Requirements

Code	Title	Hours
	University Requirements	32
	Eberly Edge Requirements	15
	Earth and Environmental Science Major Requirements	73
Total Hours		120

## University Requirements

Code	Title	Hours
	General Education Foundations (GEF) 1, 2, 3, 4, 5, 6, 7, and 8 (31-37 Credits)	
	Outstanding GEF Requirements 1, 4, 5, and 6	15
SUST 191	First-Year Seminar	1
	General Electives	16
Total Hours		32

## Eberly Edge Program Requirements

Code	Title	Hours
EDG 1:	Data and Society	3
EDG 2:	Effective and Civil Communication	3
EDG 3:	Ethics and Civil Responsibility	3
EDG 4:	Global and Regional Perspectives (SUST 102)	
EDG 5:	Practicing Arts and Sciences (ARSC 380)	3

EDG 6: High Impact Experience	3
Total Hours	15

## Earth and Environmental Science Major Requirements

Code	Title	Hours
<b>STEM FOUNDATIONS *</b>		<b>22</b>
MATH 150 or MATH 155	Applied Calculus Calculus 1	
STAT 211	Elementary Statistical Inference	
Select one pair of science courses:		
PHYS 101 & 101L & PHYS 102 & PHYS 102L	Introductory Physics 1 and Introductory Physics 1 Laboratory and Introductory Physics 2 and Introductory Physics 2 Laboratory	
PHYS 111 & 111L & PHYS 112 & PHYS 112L	General Physics 1 and General Physics 1 Laboratory and General Physics 2 and General Physics 2 Laboratory	
Select one pair of science courses:		
BIOL 115 & 115L & BIOL 117 & BIOL 117L	Principles of Biology and Principles of Biology Laboratory and Introductory Physiology and Introductory Physiology Laboratory	
CHEM 115 & 115L & CHEM 116 & CHEM 116L	Fundamentals of Chemistry 1 and Fundamentals of Chemistry 1 Laboratory and Fundamentals of Chemistry 2 and Fundamentals of Chemistry 2 Laboratory	
<b>FOUNDATION COURSES</b>		<b>19</b>
SUST 101 & 101L	Sustainable Earth and Sustainable Earth Laboratory	
SUST 102	Global Sustainability	
SUST 201 & 201L	Earth System Science and Earth System Science Laboratory	
SUST 240	Earth Data Analytics	
SUST 250 & 250L	Digital Earth and GIS and Digital Earth and GIS Laboratory	
SUST 388	Careers in Sustainability	
<b>AREA of EMPHASIS:</b>		<b>16</b>
Climate and Environmental Science		
Geoscience and Sustainable Energy		
GIS Methods		
<b>UPPER-DIVISION ELECTIVES **</b>		<b>12</b>
Select 12 credits of GEOL, GEOG or SUST at the 300-or above		
<b>CAPSTONE:</b>		<b>3</b>
Select one from the following based on the AoE selected:		
GEOL 403	Geological Data Analysis	
GEOL 404	Geology Field Camp	
GEOG 452	Geographic Information Science: Applications	
GEOL 496	Senior Thesis	
Total Hours		72

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Courses listed under the STEM Foundation section are excluded from the count of major courses at the lower and upper division.

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Courses used to fulfill an AoE requirement may not be used to fulfill upper-division electives.

## Suggested Plans of Study

### First Year

Fall	Hours	Spring	Hours
SUST 101 & 101L (F2A)		4 CHEM 115 & 115L (F8 Course 1)	4
SUST 102 (EDG 4; F7)		3 ENGL 101 (F1)	3
SUST 191		1 SUST 240	3
MATH 155 (F3)		4 EDG 2: Effective and Civil Communication	3
EDG 1: Data and Society		3 F4	3
		15	16

### Second Year

Fall	Hours	Spring	Hours
CHEM 116 & 116L (F8 Course 2)		4 ENGL 102 (F1)	3
SUST 201 & 201L		4 PHYS 101 & 101L (F8 Course 3)	4
SUST 250 & 250L (F8)		4 AoE Course 1	3
EDG 3: Ethics and Civil Responsibility		3 General Elective	4
		15	14

### Third Year

Fall	Hours	Spring	Hours
SUST 388		1 ARSC 380 (EDG 5)	3
PHYS 102 & 102L		4 SUST Studies Elective Course 1	3
AoE Course 2		3 SUST Studies Elective Course 2	3
AoE Course 3		4 AoE Course 4	3
F5		3 F6	3
		15	15

### Fourth Year

Fall	Hours	Spring	Hours
AoE Course 5		3 Capstone	3
SUST Studies Elective Course 3		3 SUST Studies Elective Course 4	3
EDG 6: High Impact Experience		3 General Elective	3
STAT 211		3 General Elective	3
General Elective		3 General Elective	3
		15	15

Total credit hours: 120

## Areas of Emphasis

- Climate and Environmental Science (p. 5)
- Geoscience and Sustainable Energy (p. 6)
- GIS Methods (p. 6)

## Climate and Environmental Science Area of Emphasis Curriculum

Code	Title	Hours
<b>CLIMATE &amp; ENVIRONMENTAL SCIENCE CORE COURSES:</b>		<b>10</b>
SUST 207 & 207L	Climate System Science and Climate System Science Laboratory	

GEOL 275	Geologic Field & Computer Methods Laboratory	
GEOL 365	Environmental Geology	
<b>CLIMATE &amp; ENVIRONMENTAL SCIENCE ELECTIVES:</b>		<b>6</b>
Select 2 courses from the following:		
GEOL 321	Geomorphology	
GEOL 463	Physical Hydrogeology	
SUST 308	Climate Modeling	
Total Hours		16

## Geoscience and Sustainable Energy Area of Emphasis Curriculum

Code	Title	Hours
GEOL 275	Geologic Field & Computer Methods Laboratory	3
GEOL 286 & 286L	Introduction to Minerals & Rocks and Introduction to Minerals & Rocks Laboratory	4
GEOL 311 & 311L	Stratigraphy and Sedimentation and Stratigraphy and Sedimentation Laboratory	4
GEOL 341 & 341L	Structural Geology and Structural Geology Laboratory	4
SUST 372	Sustainable Energy	3
Total Hours		18

## GIS Methods Area of Emphasis Curriculum

Code	Title	Hours
<b>GIS METHODS CORE COURSES:</b>		<b>10</b>
GEOG 350 & 350L	Geospatial Problem Solving and Geospatial Problem Solving Laboratory	
GEOG 451	Introduction to GIS Programming	
GEOG 455 & 455L	Introduction to Remote Sensing and Introduction to Remote Sensing Laboratory	
<b>GIS METHODS ELECTIVES:</b>		<b>6</b>
Select 2 courses from the following:		
GEOG 300	Geographical Data Analysis	
GEOG 409	Applied International Development	
GEOG 452	Geographic Information Science: Applications	
GEOG 453	Spatial Databases	
GEOG 454	Environmental Geographic Information Systems	
GEOG 456	Remote Sensing Applications	
GEOG 457	Open-Source Spatial Analytics	
GEOG 461	Web GIS	
GEOG 462	Digital Cartography	
SUST 302	Research for Sustainable Development	
Total Hours		16

## Degree Progress

- Majors are expected to maintain a 2.0 GPA overall and a 2.0 in all SUST, GEOG and GEOL courses.
- By the end of the 4th semester in the major, students should have completed SUST 201, 240, and 250 and should be making satisfactory progress through the sequence of STEM requirements for the major (CHEM 115 or CS 110; PHYS 101 or 111; and MATH 150 or 153 or 155)
- All majors must meet with their departmental advisor each semester to evaluate progress.

Students who do not meet these benchmarks may be removed from their major.

## **Major Learning Outcomes**

### **EARTH AND ENVIRONMENTAL SCIENCE**

1. Apply knowledge of the relationship between earth systems and society to sustainability challenges.
2. Develop and evaluate sustainable solutions using quantitative, qualitative, computational, or geospatial skills.
3. Identify, document, and describe relationships between rock, water, air, and life in the context of Earth as a complex and dynamic system.
4. Apply the scientific method to generate, interpret, model and evaluate 2D, 3D, and temporal data to address Earth Science and Sustainability-related problems.
5. Communicate technical information clearly and effectively in written, oral, graphical, and geospatial format to diverse audiences in order to inform evidence-based decision-making.